

THE MINERAL INDUSTRY OF AUSTRALIA

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Australia was one of the world's leading mineral-producing nations in 2003 owing to its large economic demonstrated resources (EDRs) of lead, nickel, mineral sands, tantalum, uranium, and zinc. EDRs, which are mineral resources for which profitable extraction or production is possible at current prices, are equivalent to reserves (U.S. Bureau of Mines and U.S. Geological Survey, 1980). Additionally, Australia's level of EDRs was within the top 6 worldwide for 11 additional mineral commodities—bauxite, black coal, brown coal, cobalt, copper, gem and near-gem diamond, gold, iron ore, lithium, manganese ore, and rare-earth oxides.

Australia's gross domestic product (GDP) grew at a rate of 3% in 2003 with purchasing power parity estimated to be \$571.4 billion (U.S. Energy Information Administration, 2004¹). The mineral industry represented about 8.5% of the Australian economy (Minerals Council of Australia, 2003§). The combined Australian agriculture, food, and beverage industry accounted for about 5.5% of the GDP (Minerals Council of Australia, 2002§). In 2003, Australia was the world's leading producer of alumina, bauxite, monazite, opal, rutile, sapphire, and zircon; the second leading producer of mined nickel and mined zinc; the third leading producer of cobalt, diamond (by volume), gold, ilmenite, and iron ore; the fourth leading producer of black coal and mined copper; and the fifth leading producer of aluminum metal (Edelstein, 2004; Gambogi, 2004; Hedrick, 2004; Kirk, 2004; Kuck, 2004; Plachy, 2004; Plunkert, 2004; Shedd, 2004). It was the premier exporter of alumina, coal, ilmenite, iron ore, refined lead, monazite, rutile, and zircon (Resource Information Unit, 2003, map insert). The bountiful mineral wealth of Australia enabled the country to be virtually self-sufficient in most mineral commodities. The only significant mineral resource in which Australia was not self-sufficient was petroleum. Australia, nevertheless, produced an estimated 70% of its crude oil requirements domestically in 2003. Australia also was endowed with abundant resources of other mineral fuels, which included coal, natural gas, liquefied petroleum gas, and uranium, and the country continued to be one of the few market economy countries that was a net exporter of mineral fuels (U.S. Energy Information Administration, 2004§).

Government Policies and Programs

The Timor Sea Treaty between the Governments of Australia and East Timor entered into force on April 2, 2003, as Australian Treaty Series [2003] ATS 13. The treaty was to aid East Timor's economic development and to maintain investment security for existing and planned petroleum activities in an area of seabed located between Australia and East Timor known as the Joint

Petroleum Development Area (U.S. Central Intelligence Agency, 2005§).

Structure of the Mineral Industry

The Australian mineral industry included industrial minerals, base metals, ferrous metals, nonferrous metals, precious metals, fuel minerals, and gemstones. Australia was one of the world's principal producers and suppliers of concentrates, ores, and refined metals. It was estimated to rank third in the world in the value of its nonfuel mineral production and fifth in the value of its mineral production when fuels were included.

The Australian mining industry was based on a system of free enterprise in which private companies were involved in exploration, mine development, production, mineral processing, and marketing. A number of companies in Australian mineral ventures were affiliates or subsidiaries of U.S. companies. Foreign companies controlled a large part of the mining, smelting, and refining sectors and a significant portion of the petroleum and natural gas sectors.

Many of the mineral industries were fully integrated and produced concentrates and ores or other intermediate products (for example, alumina) and refined metal or other end products (for example, cut and polished gem diamond) within the country.

The Australian mineral industry provided about 48,000 jobs directly, and about 240,000 jobs were provided in total, which included many in remote and regional areas, ports, and towns that were built as a result of mineral exploration, discovery, and extraction.

In 2003, Australia had 6 alumina refineries with a combined capacity of about 16.6 million metric tons per year (Mt/yr) and Comalco Ltd.'s 1.4-Mt/yr-capacity refinery under construction at Gladstone, Queensland, which was scheduled for completion in 2005; 6 aluminum smelters with approximately 1.8 Mt/yr total capacity; 3 copper smelters with a total capacity of about 610,000 metric tons per year (t/yr); 1 lead-zinc-silver refinery/smelter with production capacities of 250,000 t/yr, 40,000 t/yr, and 450,000 t/yr, respectively; 1 170,000-t/yr zinc refinery; 1 256,000-t/yr refined gold/81-t/yr refined silver precious-metals refinery; 1 22-t/yr gold smelter; 4 lead-zinc silver smelters with combined production capacities of 445,000 t/yr of lead, 360,000 t/yr of zinc, and 450 t/yr of silver; 1 260,000-t/yr manganese ferroalloy plant; 1 100,000-t/yr nickel smelter; 1 67,000-t/yr nickel refinery; 2 nickel-cobalt refineries with total capacities of 75,000 t/yr of nickel and 5,000 t/yr of cobalt; 3 principal crude steel plants; and 10 petroleum refineries.

Ownership of the mineral rights in Australia generally is vested in the Government of the relevant State or Territory or the Commonwealth Government for Federal lands and waters, regardless of ownership or tenure of the surface. Mineral ownership is divided between State ownership in State onshore

¹References that include a section mark (§) are found in the Internet References Cited section.

areas and Commonwealth ownership in Territories and in offshore areas beyond Australia's 4.8-kilometer (km) territorial limit. The Commonwealth's responsibility for minerals (except uranium) in the Northern Territory was, however, transferred to the Government of the Northern Territory. Thus, the individual States and Territories administered the mineral industries within their own borders, which included registering land titles; issuing exploration and development permits; overseeing mining operations, which included administration of inspections; assuring compliance with health, safety, and environmental regulations; and levying royalties and taxes.

The Commonwealth may restrict mineral exports for the good of the country and, therefore, has de facto control over most mineral production.

Commodity Review

Metals

Aluminum and Bauxite and Alumina.—Australia was the unchallenged leader for the 33d consecutive year in the production of bauxite, which was from the Northern Territory (the Gove Mine), northern Queensland (the Weipa Mine), and Western Australia (the Huntly, the Willowdale, and the Worsley Mines). The country produced almost 56 million metric tons (Mt) in 2003, which represented about 37% of world bauxite output. In terms of aluminum metal, Australia's production ranked fifth with about 7% of world production (Resource Information Unit, 2003, map insert). Bauxite deposits at Mitchell Plateau and Cape Bougainville in the north of Western Australia are uneconomic to develop but are potentially a significant future resource. Australia's aluminum industry was the country's second ranked commodity exporter, behind coal, when bauxite, alumina, and aluminum are taken into account.

Construction of Comalco's 1.4-Mt/yr alumina refinery at Gladstone, Queensland, was progressing on time, and commissioning was expected to begin in 2005. The Gladstone area already had two other alumina facilities in the area—Queensland Alumina Ltd.'s 3.8-Mt/yr Gladstone alumina refinery at Parsons Point and Boyne Smelters Ltd.'s 490,000-t/yr Boyne Island alumina smelter at Boyne Island (Resource Information Unit, 2003, p. 697).

Copper.—Australia continued to be a major copper-producing country in 2003. It had large mining and smelting operations at Olympic Dam, South Australia, and Mount Isa, Queensland. Other significant copper mining operations were Cadia Hill and Northparkes in New South Wales; Ernest Henry, Mount Gordon, and Osborne in Queensland; and Golden Grove and Nifty in Western Australia. The Mount Isa Mine, which also produced large tonnages of lead, silver, and zinc, was the leading copper producer in Australia and was one of the world's biggest underground mines (Resource Information Unit, 2002, p. 131-132).

In 2003, Australia's mined copper production ranked fourth in the world following Chile, Indonesia, and the United States (Edelstein, 2004).

Gold.—Australia has about 8% of world economic gold resources and ranked third in gold production after the Republic

of South Africa and the United States, which accounted for about 11% of world output (Amey, 2004).

Australia has active gold mines in all States and in the Northern Territory. Western Australia was by far the leading producer. Much of the gold mined in Australia in 2003 was from large open pit mines. The gold was invisible to the naked eye.

Iron Ore and Steel.—Although iron ore resources occur in all six Australian States and the Northern Territory, about 97% of the 32 billion metric tons (Gt) of the EDR are in Western Australia; this includes about 90% in the Hamersley region, which was a major world iron ore province. In 2003, Australia, which ranked third following China and Brazil in iron ore mine production, produced about 17% of world production (Kirk, 2004).

The major iron ore producers that operated in the Hamersley Province were BHP Billiton Ltd., Hamersley Iron Pty. Ltd. (a wholly owned subsidiary of Rio Tinto Ltd.), and Robe River Iron Associates [a 53% owned joint venture of Rio Tinto with a Japanese consortium that comprised Mitsui & Co. (Australia) Ltd., 33%; Nippon Steel Australia Pty. Ltd., 10.5%; and Sumitomo Metal Australia Pty. Ltd., 3.5%]. Portman Ltd. and ABM Mining Ltd. were smaller iron ore miners that operated the Cockatoo and the Koolyanobbing Mines in Western Australia and the Savage River Mine in Tasmania, respectively. OneSteel Ltd., which had been created when BHP Billiton divested some of its steel assets, operated the Whyalla Mines (formerly the Middleback Ranges Mines), which are located about 50 km west of Whyalla in South Australia and included the Iron Baron, the Iron Duchess, the Iron Duke, the Iron Knob, and the Iron Prince Mines. The Iron Baron and the Iron Knob Mines were almost depleted after more than a century of mining (Resource Information Unit, 2003, p. 180).

Lead, Silver, and Zinc.—Australia's lead, silver, and zinc mines were predominantly based on zinc-rich ore bodies with zinc as the major component and lead and silver as byproducts. An exception was BHP Billiton's Cannington underground mine in Queensland. It was based on a lead-silver ore body with zinc as a byproduct. The Cannington Mine, which had the largest single mine silver production in 2003, contributed more than 4% of global silver production and was the second largest known silver deposit in the world in terms of proved and probable reserves. MIM Holdings Ltd.'s Mount Isa and Hilton George Fisher deposits at Mount Isa, Queensland, ranked as the third and fifth largest known silver deposits, respectively, and together in 2003, ranked fifth among individual producers in the world.

Australia ranked first in the world in lead reserves, was tied with China in zinc reserves, and was third after Mexico and Peru in silver reserves owing to the development of the large zinc-lead-silver deposits at the Cannington, the Century, and the McArthur River Mines. These positions were further supported by the reserves of the many other base-metal and silver-bearing gold deposits of lesser size in Australia (Hilliard, 2004; Plachy, 2004; Smith, 2004).

Manganese.—Groote Eylandt Mining Co. Pty. Ltd. (GEMCO) mined about 15% of the world's manganese at its 2.4-Mt/yr-capacity 84-square-kilometer (km²) Groote Eylandt open pit operations on the northwestern portion of Groote Eylandt, which is located in the west of the Gulf of Carpentaria,

Northern Territory. The operations at Groote Eylandt used excavators and 145-metric-ton (t) end-dump trucks for removal of overburden and ore mining. The onsite concentrator produced clean lump and fines ore products that were trucked to Milner Port Bay for shipment. GEMCO shipped about 25% of its concentrates annually to the ferromanganese plant operated by Tasmanian Electro Metallurgical Co. Pty. Ltd. (a wholly owned subsidiary of BHP Billiton) at Bell Bay near Launceston, Tasmania. A smaller percentage was used in an electrolytic manganese dioxide plant at Newcastle, New South Wales, by Australian Manganese Co. Pty. Ltd. (a wholly owned subsidiary of BHP Billiton). The plant produced the high-grade material used in long-life batteries. Other GEMCO customers were the makers of ferroalloys and steel in Australia, Canada, China, Europe, Japan, Mexico, Norway, the Republic of Korea, and the United States (Corathers, 2004; Resource Information Unit, 2003, p. 109).

Pilbara Manganese Pty. Ltd. owned and operated the 300,000-t/yr-capacity manganese mine at Woodie Woodie, which is located 400 km southeast of Port Hedland, Western Australia. The mine also included the adjacent Bells, Hanna, and Lewis open pits; the Hanna Pit was depleted near yearend, and rehabilitation work had begun. The ores from the various pits were blended to produce a consistent product.

Mineral Sands.—Mineral sands deposits are concentrations of ilmenite, rutile, and zircon that occur along the coast of eastern Australia from central New South Wales to Cape York, Queensland. Large relic beach deposits are found as far inland as Ouyen, Victoria; in southwestern New South Wales; and in more than 300,000 km² of the Murray Basin, South Australia. In Western Australia, deposits are distributed from the southern tip of the state to Geraldton and are located at the coastline or as relic deposits up to 35 km inland. The eastern deposits generally have a total heavy-mineral content of from 1% to 5%; ilmenite, rutile, and zircon each make up about one-third. In Western Australia, the deposits also have a total heavy-mineral content of about the same or a slightly higher percentage, but the ilmenite portion of this content approaches about 70% (Minerals Council of Australia, undated a§). In 2003, Australia had a substantial portion of world mineral sands resources—45% for rutile, up to 45% for zircon, and about 32% for ilmenite (Gambogi, 2004; Hedrick, 2004).

Nickel and Cobalt.—Australia ranked first in economic resources of nickel and second in economic resources of cobalt, after the Democratic Republic of the Congo [Congo (Kinshasa)]. Australia's main nickel ores were primary sulfides of nickel, which occur as lodges within mafic and ultramafic (iron- and magnesium-rich) igneous rocks that have a volcanic origin, although most of the world's identified resources are contained in nickel-bearing laterite and nickeliferous limonite. These are secondary deposits that are derived from the weathering of nickel-bearing mafic and ultramafic rocks in tropical and subtropical climates.

With about 17% of the world's nickel production in 2003, Australia moved into second place behind Russia (Kuck, 2004). Australia ranked third, following Zambia and Congo (Kinshasa), in mined cobalt in 2003 (Shedd, 2004). Most of Australia's nickel-cobalt mines are in the Kalgoorlie and the Leonora

regions of Western Australia (Resource Information Unit, 2003, map insert).

Tin.—Murchison United NL's Renison Bell Mine in Tasmania and Marlborough Resources NL's Ardlethan Mine in central New South Wales were essentially Australia's only tin mines. Sons of Gwalia Ltd.'s Greenbushes Mine in Western Australia produced minor amounts of byproduct tin that was recovered along with the tantalum-bearing mineral tantalite. Australia supplied about 3% of world tin production in 2003 (Carlin, 2004). Ardlethan and Murchison shipped their concentrate overseas for processing. Ardlethan's went to the Malaysian Smelting Corp. in Penang, Malaysia, and Murchison's was sold to Thailand Smelting and Refining Co. Ltd. for smelting at Phuket, Thailand (Australian Journal of Mining, 2002).

In May 2003, Murchison suspended mining and treatment operations for 8 weeks to undertake maintenance work and to arrange recapitalization of the project through development of the South Renison decline to access the high-grade Federal ore bodies (Resource Information Unit, 2003, p. 196).

Industrial Minerals

Garnet.—GMA Garnet Pty. Ltd. produced industrial-grade garnet at its Port Gregory open pit, which is located 100 km north of Geraldton, Western Australia. The processed garnet product was used domestically (40%) and exported through the Ports of Fremantle and Geraldton to Asia, the United States, and Western Europe for use as an abrasive in industrial cleaning and maintenance and as a high-pressure cutting agent (Resource Information Unit, 2003, p. 233).

Gemstones.—Australia, which was the leading producer of precious opal in 2003, accounted for a large percentage of world production. About one-half of Australia's annual production was mined in South Australia's three major fields at Andamooka, Coober Pedy, and Mintabie, and many smaller fields that stretch from Andamooka to the Northern Territory border along the southwestern margin of the Great Artesian Basin. Most opal was hand mined in either open pits or underground drifts, and all grades from milky pinfire through crystal up to high-grade black were produced. Lambina, which was a newer field, increased its production at the expense of Coober Pedy, although Coober Pedy still produced, in terms of value, almost three times that of Lambina. Opal in New South Wales was mined at Lightning Ridge, which was the world's major source of the highly prized and valuable black opal. A small quantity of opal was produced in western Queensland.

In 2003, two diamond mines were operating in Australia—Rio Tinto's huge Argyle open pit in the Ellendale diamond province of the western Kimberley region of Western Australia and Kimberley Diamond Co.'s Ellendale Mining Lease about 200 km to the southeast of the Argyle Mine. In early 2003, Argyle Diamond Mines Pty. Ltd. closed the Merlin diamond mine after the company failed to receive a viable sales offer (Resource Information Unit, 2003, p. 96, 222, 225).

Other diamond operations had various activities ongoing, which included drilling, sampling, trenching, tunneling, and/or washing of materials, but they did not produce any diamond.

Argyle was the world's single largest producer of diamond. Mining from the AK-1 lamproite pipe at Argyle began in 1985. Diamond also was recovered from alluvial material in the nearby Limestone and Smoke Creeks where initial mining at Argyle had begun in 1983 and continued through 2001. During 2002, this operation ended owing to resource depletion. The life of the open pit at Argyle was thought to extend to 2007, but because the AK-1 pipe continued at depth, underground mining could possibly extend the mine life to 2020 (Resource Information Unit, 2003, p. 223).

Diamond produced at Argyle was sorted in Perth and then prepared for international sale at Argyle's European sales office in Antwerp, Belgium. Argyle specialized in fancy diamond, such as champagne, cognac, and the rare pink (Resource Information Unit, 2002, p. 428).

Australia also continued to be a leading producer of natural sapphire. Commercial sapphire production was mined from alluvial deposits in the Inverell-Glen Innes (New England) region of northern New South Wales and the Rubyvale-Anakie region of central Queensland. Australia supplied as much as 30%, by volume, of the world's rough sapphire output. Most of the uncut gems were exported to Thailand, which was the recognized world leader for cutting and marketing.

Jade was discovered in the form of nephrite, which is one of the two recognized jade minerals (the other being jadeite), near Cowell on the Eyre Peninsula, South Australia. These deposits were the world's largest identified resource of nephrite jade. Australia produced most of the world's chrysoprase, which is known as Australian jade outside of Australia.

Australia produced such other gemstones as agate, amethyst, chiasolite, emerald (aquamarine), garnet, rhodonite, topaz, tourmaline, turquoise, and zircon (Primary Industries and Resources South Australia, 2000, p. 19; Resource Information Unit, 2002, p. 116-119).

Phosphate Rock.—Australia had two active phosphate rock operations in 2001. Christmas Island Phosphates Pty. Ltd. (a subsidiary of Western Australia's Phosphate Resources Ltd.) operated an open pit mine on Christmas Island (an overseas dependent area of Australia that is located about 360 km south of Java, Indonesia, in the Indian Ocean) and WMC Fertilizers Ltd. (the wholly owned subsidiary of WMC Ltd.) operated the Phosphate Hill-Duchess open pit mine southeast of Mount Isa, Queensland. Phosphate has been mined on Christmas Island since 1897.

In 1997, the Federal Government awarded a 21-year mining lease to Christmas Island Phosphates, which had been mining phosphate on the island under contract since 1990. Production was marketed to fertilizer manufacturers in Australia and Southeast Asia (Resource Information Unit, 2002, p. 378). Mining began in 1999 at the Phosphate Hill-Duchess Mine with a planned maximum rate of 2.2 Mt/yr of phosphate rock for the production of fertilizer. About one-half of production was sold domestically, and the remainder was exported to Southeast Asia and New Zealand (Australian Journal of Mining, 2002).

Mineral Fuels

Coal.—In 2003, Australia was the world's leading exporter of coal as it has been since 1984.

Petroleum and Natural Gas.—In 2003, Western Australia and the adjacent Commonwealth offshore areas accounted for about 55% of Australia's total oil and condensate and all the country's liquefied natural gas (LNG) production. Apart from having the appropriate geology, the country's enormous size (onshore and offshore) make these production levels possible. Onshore Western Australia has a land area of more than 2.5 million square kilometers, which is nearly four times the size of Texas. Additionally, the State's offshore area encompasses an area nearly four times larger than Europe's North Sea and larger than North America's Gulf of Mexico.

In 2003, Australia produced about 70% of its crude oil requirements. Australia's expanding oil deficit was primarily a result of demand steadily outpacing supply. The Australian Government has estimated that the country was using its crude petroleum about three times faster than exploration projects were discovering new production fields. By 2010, self-sufficiency was expected to slide to only 40% (U.S. Energy Information Administration, 2002§).

Australia has 10 crude oil refineries with a total distillation capacity of about 850,000 barrels per day (bbl/d). The country's three largest facilities were BP p.l.c.'s Kwinana Refinery in Western Australia, which had a capacity of 158,500 barrels per day (bbl/d) of crude oil; ChevronTexaco Corporation's Kurnell Refinery in New South Wales, 114,000 bbl/d of crude oil; and Exxon Mobil Corp.'s Altona Refinery in Victoria, 130,000 bbl/d of crude oil (U.S. Energy Information Administration, 2002§). The total number of petroleum exploration and development wells drilled during 2003 (181) was 11 more than that of 2002 (170). The number of onshore exploration wells drilled in 2003 (36) was 4 less than that of 2002 (40, revised). During 2003, the number of offshore exploration wells drilled increased to 55 compared with that of 2002 when 7 fewer wells were drilled. The total number of exploration wells drilled in 2003 increased to 91 from that drilled in 2002 (88). The total number of development wells drilled (90) was 8 more than that of 2002 (82); 61 wells were drilled onshore, which was a decrease of 7 wells compared with that of 2002; and 29 wells were drilled offshore compared with 26 wells drilled in 2002 (Geoscience Australia, 2003).

Uranium.—Australia had three active uranium mining operations in 2003—Heathgate Resources Pty. Ltd.'s Beverley in situ leach (ISL) operation in South Australia, which was the latest of the active uranium mines to come onstream; WMC's Olympic Dam underground copper-silver-gold-uranium mine also in South Australia, which was one of the largest mines in the world; and Energy Resources of Australia Ltd.'s (ERA) Ranger open pit mine in the Northern Territory, which was the oldest of the active mines. Because Australia has no significant national demand for uranium, virtually all production was exported. Uranium oxide, or yellowcake, exports were made only under close supervision of stringent international and bilateral safeguard regulations to ensure that it would be used

only for peaceful purposes (Minerals Council of Australia, undated b§).

The Beverley Mine, which was South Australia's second leading uranium mine, was officially opened on February 21, 2001, although it had begun production in 2000 after receiving all environmental approvals to proceed. The uranium was being extracted by the ISL mining process, which enabled the resource to be recovered without major impact on the environment. The Beverley Mine was expected to produce about 1,000 t/yr of yellowcake for about 15 years, although ongoing exploration on surrounding leases was expected to extend the mine life. After being trucked to Port Adelaide, the yellowcake was shipped to the United States under sales agreements with nuclear power utilities. Heathgate Resources was a subsidiary of General Atomics, which was a uranium miner, processor, and nuclear power station designer headquartered in the United States (Heathgate Resources Pty. Ltd., 2001; Resource Information Unit, 2003, p. 188).

The Olympic Dam uranium operation included a fully integrated metallurgical complex with a grinding/concentrating circuit and a hydrometallurgical plant that incorporated a solvent extraction circuit for the production of about 4,300 t/yr of yellowcake. The bulk of the uranium production was committed under long-term sales contracts with electricity-generating facilities in Belgium, Canada, Finland, France, Japan, the Republic of Korea, Sweden, the United Kingdom, and the United States.

Yellowcake was first produced from the Ranger Mine in August 1981, and the life of the mine was anticipated to end in 2007, with processing of Ranger ore expected to be completed during 2010. All ERA's yellowcake sales were to energy companies in France, Germany, Japan, the Republic of Korea, Spain, Sweden, the United Kingdom, and the United States (Resource Information Unit, 2002, p. 404; Uranium Information Center, 2002§).

Reserves

Australia ranked as one of the leading mineral-resource nations. It had the largest EDR of lead, mineral sands, nickel, tantalum, uranium, and zinc in the world. Its EDR also ranked in the top six worldwide for bauxite, black and brown coal, cobalt, copper, gem and near-gem diamond, gold, iron ore, lithium, manganese ore, rare-earth oxides, and silver (table 3; Geoscience Australia, 2004).

Infrastructure

The transportation infrastructure of Australia was well developed. Of the 913,000 km of roads, 353,331 km was paved, which included 1,363 km of expressways, and 559,669 km was unpaved. Inland waterways, of which 8,368 km was usable mainly by small shallow-draft craft, were of little importance to the transportation industry. The public sector railway system consisted of 46,200 km of track, of which 23,648 km was standard [1.435-meter (m)] gauge, 15,456 km was narrow (1.067-m) gauge, 2,193 km was broad (1.600-m) gauge, and 291 km was dual gauge. Australia had 4,612 km of electrified

rail. Additionally, a few hundred kilometers of rail were privately owned and served mainly the iron ore industry in Western Australia. Of the 444 airports in operation in 2003, 294 were principal with permanent-surface runways. International shipping ports included Adelaide, Brisbane, Cairns, Darwin, Devonport (Tasmania), Esperance, Fremantle, Geelong, Hobart (Tasmania), Launceston (Tasmania), Mackay, Melbourne, Sydney, and Townsville. The merchant marine fleet included 7 petroleum-oil-lubricant tankers; 3 chemical tankers; 4 LNG tankers; 35 bulk, roll-on/off, cargo-container freighters; and 2 passenger vessels. Pipelines included 5,600 km for natural gas, 2,500 km for crude oil, and 500 km for refined petroleum products (U.S. Central Intelligence Agency, 2003§).

Electricity-generating capacity was 43 gigawatts, of which 84% was thermal (mostly coal) and 14% was hydroelectric power (U.S. Energy Information Administration, 2004§).

Outlook

Australia continued its position as one of the world's leading mineral-producing nations in 2003. This position is expected to hold well into the future owing to its large EDRs, especially bauxite, gold and silver, lead, nickel, mineral sands, tantalum, uranium, and zinc.

References Cited

- Amey, E. B., 2004, Gold: U.S. Geological Survey Mineral Commodity Summaries 2004, p. 72-73.
- Australian Journal of Mining, 2002, News—WMC fertilizer reaches million tonne milestone: Australian Journal of Mining, v. 16, no. 176, March/April, p. 15.
- Carlin, J.F., Jr., 2004, Tin: U.S. Geological Survey Mineral Commodity Summaries 2004, p. 174-175.
- Corathers, L.A., 2004, Manganese: U.S. Geological Survey Mineral Commodity Summaries 2004, p. 104-105.
- Edelstein, D. L., 2004, Copper: U.S. Geological Survey Mineral Commodity Summaries 2004, p. 54-55.
- Gambogi, Joseph, 2004, Titanium mineral concentrates: U.S. Geological Survey Mineral Commodity Summaries 2004, p. 176-177.
- Geoscience Australia, 2003, Australian petroleum exploration and development activity [quarterly]: Canberra, Australia, Geoscience Australia, March, 4 p.
- Geoscience Australia, 2004, Australia's identified mineral resources 2004: Canberra, Australia, Geoscience Australia, p. 9.
- Heathgate Resources Pty. Ltd., 2001, Beverley uranium mine officially opened: Adelaide, Australia, Heathgate Resources Pty. Ltd. press release, February 21, 1 p.
- Hedrick, J.B., 2004, Zirconium and hafnium: U.S. Geological Survey Mineral Commodity Summaries 2004, p. 190-191.
- Hilliard, H.E., 2004, Silver: U.S. Geological Survey Mineral Commodity Summaries 2004, p. 150-151.
- Kirk, W.S., 2004, Iron ore: U.S. Geological Survey Mineral Commodity Summaries 2004, p. 84-85.
- Kuck, P.H., 2004, Nickel: U.S. Geological Survey Mineral Commodity Summaries 2004, p. 114-115.
- Plachy, Jozef, 2004, Zinc: U.S. Geological Survey Mineral Commodity Summaries 2004, p. 188-189.
- Plunkert, P.A., 2004 Bauxite and alumina: U.S. Geological Survey Mineral Commodity Summaries 2004, p. 30-31.
- Primary Industries and Resources South Australia, 2000, Minerals South Australia—Primary industries and resources South Australia: Primary Industries and Resources South Australia Earth Resources Information Sheet M13, 55 p.
- Resource Information Unit, 2002, Register of Australian mining 2002/2003: Subiaco, Australia, Resource Information Unit, 727 p.

Resource Information Unit, 2003, Register of Australian mining 2003/2004: Subiaco, Australia, Resource Information Unit, 739 p.

Shedd, K.B., 2004, Cobalt: U.S. Geological Survey Mineral Commodity Summaries 2004, p. 50-51.

Smith, G.R., 2004, Lead: U.S. Geological Survey Mineral Commodity Summaries 2004, p. 94-95.

U.S. Bureau of Mines and U.S. Geological Survey, 1980, Principles of a resource/reserve classification for minerals: U.S. Geological Survey Circular 831, 5 p.

Internet References Cited

Minerals Council of Australia, [undated] a, Mineral sands, Facts on Minerals, accessed May 9, 2002, at URL http://www.minerals.org.au/pages/page3_42.asp.

Minerals Council of Australia, [undated] b, Uranium, Facts on Minerals, accessed May 9, 2002, at URL http://www.minerals.org.au/pages/page3_46.asp.

Minerals Council of Australia, 2002 (July 16), The Australian minerals industry, accessed October 13, 2002, at URL <http://www.minerals.org.au/defaultx.htm>.

Minerals Council of Australia, 2003 (June 17), The Australian minerals industry, accessed September 15, 2003, at URL http://www.minerals.org.au/information_centre/Australian_Minerals.htm?menu=45.

Uranium Information Center, 2002 (August), Australia's uranium mines—Ranger, accessed at URL <http://www.uic.com.au/emine.htm>.

U.S. Central Intelligence Agency, 2003 (January 1), Australia, World Factbook 2003, accessed October 7, 2003, at URL <http://www.odci.gov/cia/publications/factbook/print/as.html>.

U.S. Central Intelligence Agency, 2005 (January 1), Australia, World Factbook 2005, accessed January 24, 2005, at URL <http://www.cia.gov/cia/publications/Factbook/print/as.htm>.

U.S. Energy Information Administration, 2002 (May), Australia, Country Analysis Brief, accessed October 18, 2002, at URL <http://www.eia.doe.gov/emeu/cabs/australi.htm>.

U.S. Energy Information Administration, 2004 (November), Australia, Country Analysis Brief, accessed January 24, 2005, at URL <http://www.eia.doe.gov/emeu/cabs/australi.html>.

TABLE 1
AUSTRALIA: PRODUCTION OF MINERAL COMMODITIES¹

(Metric tons unless otherwise specified)

Commodity		1999	2000	2001	2002	2003 ^P
METALS						
Aluminum:						
Bauxite, gross weight	thousand tons	48,416	53,802	53,799	54,135 ^r	55,602
Alumina	do.	14,532	15,680	16,313	16,382 ^r	16,529
Metal, refined:						
Primary	do.	1,718	1,769	1,798	1,817	1,857
Secondary		108,000 ^r	110,000 ^e	127,000	127,000	127,200 ^e
Antimony, Sb content of ores and concentrates		1,679	1,511	1,380	1,200 ^e	900 ^e
Cadmium:						
Mine output, Cd content ^c		1,900	1,900	1,900	1,900	1,900
Metal, smelter, refined		462	552	378	370 ^r	350
Chromium, chromite, gross weight		70,000	90,000	11,800	132,665	138,826
Cobalt:						
Co content in laterite ore, Ni concentrate, and Zn concentrate		4,100 ^r	5,600 ^r	6,200	6,500 ^r	7,000
Metal, refined		1,700	2,610	3,470	3,500 ^e	3,840
Columbium-tantalum concentrate, gross weight		1,230	1,600	2,220	3,100	1,140
Copper:						
Mine output, Cu content	thousand tons	741	832	873	883	830
Metal:						
Smelter, primary	do.	332	387	456	469	435
Refined:						
Primary	do.	412	484	558	543	484
Secondary ^e	do.	25	-- ^r	-- ^r	-- ^r	-- ²
Gold:						
Mine output, Au content	kilograms	301,070	296,410	285,030	273,010	282,000
Metal, refined:						
Primary	do.	376,000	349,000	304,770	300,000 ^e	252,000
Secondary	do.	66,000	7,640	68,310	68,000 ^e	100,000 ^e
Iron and steel:						
Iron ore:						
Gross weight	thousand tons	151,558	171,508	181,435	182,704	187,219
Fe content	do.	93,807	106,563	112,592	113,548	116,355
Metal:						
Pig iron	do.	7,468	7,000 ^e	7,200	8,574 ^r	9,660
Ferroalloys: ^c						
Ferromanganese		98,000	115,000	115,000	115,000	115,000
Silicomanganese		116,000	135,000	135,000	135,000	135,000
Total		214,000	250,000	250,000	250,000	250,000
Steel, crude	thousand tons	8,481	7,297	7,076	8,242	9,660
Semimanufactures ^c		5,000	5,000	5,000	5,000	5,000
Lead:						
Mine output, Pb content	thousand tons	681	739	714	683	688
Metal:						
Primary:						
Bullion	do.	162	139	195	181	169
Refined	do.	239	223	237	287	270
Total	do.	401	362	432	468	439
Secondary excluding remelt	do.	33	28	33 ^r	34 ^r	40
Manganese ore, metallurgical:						
Gross weight	do.	1,900	1,613	2,069	2,187	2,555
Mn content	do.	929	787	948	983	1,247
Nickel:						
Mine output, Ni content	do.	119 ^r	166	205 ^r	208 ^r	179
Metal, smelter, refined Ni and Ni content of oxide	do.	83	112	128	133	209
Platinum-group metals:						
Palladium, Pd content	kilograms	816	812	828	800 ^e	820 ^e
Platinum, Pt content	do.	90	171	174	200 ^e	225 ^e
Total	do.	906	983	1,002	1,000 ^e	1,050 ^e

See footnotes at end of table.

TABLE 1--Continued
 AUSTRALIA: PRODUCTION OF MINERAL COMMODITIES¹

(Metric tons unless otherwise specified)

Commodity	1999	2000	2001	2002	2003 ^P
METALS--Continued					
Silver:					
Mine output, Ag content	1,720	2,060	1,970	2,077	1,868
Metal, refined	472	538	576	542	227
Tin:					
Mine output, Sn content	10,011	9,146	9,802	6,268	3,819
Metal, refined:					
Primary	585	733	1,094	611	597
Secondary ^e	300	300	400	400	400
Titanium concentrates, gross weight:					
Ilmenite	1,976	2,146	2,017	1,917	2,006
Leucocoxene	32,000	27,000	30,000	39,000	57,000
Rutile	179,000	208,000	206,000	218,000	173,000
Zinc:					
Mine output, Zn content	1,163	1,420	1,519	1,469	1,479
Metal, smelter:					
Primary	344	490	554	567	553
Secondary ^e	4,500	4,500	4,500	4,500	4,500
Zirconium concentrates, gross weight	359	374	394	412	462
INDUSTRIAL MINERALS					
Abrasives, natural: ^c					
Beach pebble	2,000	2,000	2,000	2,000	2,000
Garnet	25,000	25,000	25,000	25,000	25,000
Barite ^e	18,000	20,000	20,000	20,000	20,000
Cement, hydraulic ^c	7,450	7,500	7,500	7,550	8,000
Clays: ^e					
Bentonite and bentonitic clay	180,000	180,000	180,000	200,000	200,000
Brick clay and shale	8,000	8,000	8,000	8,000	8,000
Cement clay and shale	500	500	500	500	500
Damourite clay	100	100	100	100	100
Fire clay	25,000	25,000	25,000	25,000	25,000
Fuller's earth, attapulgite	5,639 ²	5,600	5,600	6,000	6,000
Kaolin and ball clay	200,000	220,000	220,000	230,000	240,000
Other	1,000	1,000	1,000	1,000	2,000
Diamond:					
Gem	16,381	14,656	14,397	15,136	13,981
Industrial	13,403	11,992	11,779	18,500	17,087
Total	29,784	26,648	26,176	33,636	31,068
Diatomite ^e	20,000	20,000	20,000	20,000	20,000
Feldspar including nepheline syenite ^e	49,600	50,000	50,000	50,000	50,000
Gemstones, other than diamond:					
Opal	54	76	70	62	65
Sapphire	6	8	6	1	--
Total	60	84	76	63	65
Gypsum ^e	1,900 ^r	2,500 ^r	3,800	3,800 ^r	4,000
Kyanite ^e	1,000	1,000	1,000	1,000 ^r	1,000
Lime ^e	1,500,000	1,500,000	1,500,000	1,500,000	1,500,000
Magnesite	280,505	349,783	605,314	484,314	472,668
Nitrogen, N content of ammonia	430,900	575,500	762,200	686,400	700,000
Perlite, crude ^e	5,000	5,000	5,000	5,000	5,000
Phosphate rock	2,000	2,108	977,100	2,024,580	2,100,000 ^e
Salt	10,022	8,798	9,536	10,000 ^e	10,400 ^e
Sillimanite ^{e,s}	300	300	300	300	300
Spodumene, concentrate	75,824	81,891	63,443	100,000 ^e	110,000 ^e
Stone and sand and gravel: ^c					
Construction sand	33,000	33,000	35,000	38,000	40,000
Gravel	15,000	15,000	15,000	15,000	20,000
Dolomite	10,000	10,000	10,000	10,000	10,000
Limestone, for cement	6,000	6,000	6,000	10,000	10,000
Limestone, for other uses	6,000	6,000	6,000	10,000	10,000
Silica in the form of quartz, quartzite, glass sand	2,500	4,266	4,500	4,500	5,000

See footnotes at end of table.

TABLE 1--Continued
 AUSTRALIA: PRODUCTION OF MINERAL COMMODITIES¹

(Metric tons unless otherwise specified)

Commodity	1999	2000	2001	2002	2003 ^P	
INDUSTRIAL MINERALS--Continued						
Stone and sand and gravel--Continued: ^e						
Other:						
Crushed and broken stone	thousand tons	75,000	80,000	80,000	80,000	80,000
Dimension stone	do.	110	120	120	120	120
Unspecified	do.	30,000	30,000	30,000	30,000	30,000
Sulfur, byproduct:						
Metallurgy	do.	441	654	817	899	900
Petroleum	do.	25	30	45	60	60
Total	do.	466	684	862	959	960
Talc, chlorite, pyrophyllite, steatite		190,384	180,272	174,946	172,241	174,000 ^e
MINERAL FUELS AND RELATED MATERIALS						
Coal:						
Bituminous and subbituminous	thousand tons	238,200	245,500	264,680	347,890	257,790
Lignite ^e	do.	66,000	67,000	70,000	73,000	67,000
Total ^e	do.	304,200	312,500 ^r	334,680 ^r	420,890 ^r	325,000
Coke, metallurgical ^e	do.	325	325	300	300	300
Fuel briquets ^e	do.	750	750	800	800	800
Gas, natural, marketed	million cubic meters	30,743	30,794	30,000 ^e	31,000 ^e	30,000 ^e
Natural gas liquids	thousand 42-gallon barrels	47,097	47,260	47,000 ^e	47,300 ^e	47,000 ^e
Peat ^e		15,000	30,000 ^r	30,000	30,000	50,000
Petroleum:						
Crude	thousand 42-gallon barrels	226,665	263,500	231,000	240,000 ^e	250,000 ^e
Refinery products:						
Gasoline:						
Aviation	do.	1,069	975	868	900 ^e	950 ^e
Motor	do.	120,991	113,228	112,767	113,000 ^e	115,000 ^e
Jet fuel	do.	33,610	35,585	362,138	363,000 ^e	365,000 ^e
Kerosene	do.	704	147	245	250 ^e	300 ^e
Distillate fuel oil	do.	84,833	80,222	84,862	85,000 ^e	85,000 ^e
Residual fuel oil	do.	10,190	12,442	12,132	12,100 ^e	12,000 ^e
Lubricants	do.	4,038	4,284	3,950	4,000 ^e	4,000 ^e
Liquefied petroleum gas	do.	4,642	10,536	11,145	11,200 ^e	115,000 ^e
Bitumen	do.	4,000 ^e	4,328	4,610	5,000 ^e	5,000 ^e
Unspecified	do.	6,932	7,574	4,654	5,000 ^e	5,000 ^e
Total ⁴	do.	271,000 ^r	269,321	597,371	599,000 ^{r,e}	604,000 ^e
Uranium, mine output, U ₃ O ₈ content		5,992 ⁵	7,588 ⁵	7,680 ⁵	3,536	8,912 ²

^eEstimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. ^PPreliminary ^rRevised.

-- Zero.

¹Includes data available through October 1, 2004.

²Reported figure.

³In addition, about 7,000 metric tons per year of sillimanite clay (also known as kaolinized sillimanite) that contains from 40% to 48% aluminum oxide is produced.

⁴Excludes refinery fuel and losses.

⁵U content.

TABLE 2
AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2003

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities ^{1,2}	Annual capacity ^c
Alumina	Queensland Alumina Ltd., operator [Rio Tinto Ltd., 30.3%; Kaiser Aluminum and Chemical Corp. (Australia) Ltd., 28.3%; Alcan South Pacific Pty. Ltd., 21.4%; Pechiney Australia Pty. Ltd., 20%]	Gladstone alumina refinery, QLD	3,800
Do.	Alcan Northern Territory Pty. Ltd., 70%, and Alcan South Pacific Pty. Ltd., 30%	Gove alumina refinery, NT	1,900
Do.	Alcoa World Alumina Australia, 100%	Kwinana alumina refinery, WA	2,100
Do.	do.	Pinjarra alumina refinery, WA	3,400
Do.	Alcoa World Alumina Australia, 60%, and Western Mining Corp., 40%	Wagerup alumina refinery near Waroona, WA	2,200
Do.	Worsley Alumina Pty. Ltd., manager [Billiton Aluminium Australia Pty. Ltd., 86%; Billiton Plc, 30%; Kobe Alumina Associates (Australia) Pty. Ltd., 10%; Nissho Iwai Alumina Pty. Ltd., 4%]	Worsley alumina refinery, 20 km NW of Collie, WA	3,200
Aluminum	Comalco Aluminium (Bell Bay) Ltd., 100%	Bell Bay aluminum smelter, TAS	142
Do.	VAW Kurri Kurri Pty. Ltd., 100%	Kurri Kurri aluminum smelter, NSW	150
Do.	Boyne Smelters Ltd., operator (Rio Tinto Ltd., 64%; Sumitomo Light Metal Industries Ltd., 17%; Ryowa Development Pty. Ltd., 12%; Kobe Steel Ltd., 5%; Sumitomo Chemical Co. Ltd., 2%)	Boyne Island aluminum smelter, QLD	490
Do.	Alcoa of Australia, 100%	Point Henry aluminum smelter, VIC	185
Do.	Alcoa of Australia, 45% and manager; China International Trust Investment Co. (a Chinese Government agency), 2.5%; Marubeni Australia Pty. Ltd., 22.5%; Eastern Aluminum Ltd., 10%	Portland aluminum smelter, VIC	345
Do.	Tomago Aluminium Co. Pty. Ltd., operator (Gove Aluminium Finance Ltd., 36%; Pechiney Australia Pty. Ltd., 36%; Australian Mutual Provident Society, 16%; VAW Australia Pty. Ltd., 12%)	Tomago aluminum smelter, NSW	444
Antimony	New England Antimony Mines NL, 100%	Hillgrove underground antimony-gold mine, 25 km E of Armidale, NSW	4
Bauxite	Alcan Inc., 100%	Gove open pit bauxite mine, Gove Peninsula, NT	7,000
Do.	Alcoa World Alumina Australia, 100%	Huntly open pit bauxite mine, 80 km S of Perth, WA	20,000
Do.	Comalco Ltd., operator (Rio Tinto Plc, 100%)	Weipa-Andoom open pit bauxite mine, Weipa, QLD	12,000
Do.	do.	Willowdale open pit bauxite mine, 130 km S of Perth, WA	8,600
Do.	Worsley Alumina Pty. Ltd., manager [BHP Billiton Ltd., 86%; Kobe Alumina Associates (Australia) Pty. Ltd., 10%; Nissho Iwai Alumina Pty. Ltd., 4%]	Worsley open pit bauxite mine, 50 km NE of Collie, WA	11,000
Bentonite	Arumpo Bentonite Pty. Ltd., 100%	Arumpo open pit bentonite mine, 95 km NE of Mildura, NSW	10
Do.	Unimin Australia Ltd., 100%	Cressfield open pit bentonite mine, 20 km N of Scone, NSW	12
Do.	do.	Miles open pit bentonite mine, 350 km W of Brisbane, QLD	100
Cement	Blue Circle Southern Cement Ltd., 100%	Berrima Cement Plant, NSW	1,200
Do.	Adelaide Brighton Cement Ltd., 100%	Birkenhead Cement Plant, SA	1,000
Do.	Queensland Cement Ltd., 100%	Darra Cement Plant, QLD	700
Do.	Adelaide Brighton Cement Ltd., 100%	Geelong Cement Plant, VIC	800
Do.	Goliath Cement Holdings Ltd., 100%	Railton Cement Plant, TAS	1,000
Do.	Cockburn Cement Ltd., 100%	South Coogee Cement Plant, WA	1,000
Chromite	Sylvania Resources Ltd., 100%	Coobina open pit chromite mine, 56 km ESE of Newman, WA	100
Coal, black	Powercoal Pty. Ltd., 100%	Angus Place longwall coal mine, 16 km NW of Lithgow, NSW	2,200

See footnotes at end of table.

TABLE 2--Continued
 AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2003

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities ^{1,2}	Annual capacity ^c
Coal, black--Continued:	BHP Steel (AIS) Pty. Ltd., 100%	Appin longwall coal mine, 40 NW of Wollongong, NSW	3,300
Do.	Powercoal Pty. Ltd., 100%	Awaba underground coal mine, 30 km SW of Newcastle, NSW	2,000
Do.	Oakbridge Pty. Ltd., 95%, and Sumitomo Corp., 5%	Baal Bone longwall coal mine, 24 km NW of Lithgow, NSW	3,500
Do.	BHP Billiton Hunter Valley Energy Coal, 100%	Bayswater open pit coal mine, 33 km NW of Singleton, 13 km SSW of Muswellbrok, NSW	5,500
Do.	Coal and Allied Industries Ltd., 40% and manager (Wesfarmers Bengalla Ltd., 40%; MCDA Bengalla Investment Pty. Ltd., 10%; Taipower Bengalla Pty. Ltd., 10%)	Bengalla open pit coal mine, 5 km W of Muswellbrook, NSW	5,000
Do.	Berrima Coal Pty. Ltd., 100%	Berrima underground coal mine, 60 km NE of Goulburn, NSW	2,000
Do.	BHP Billiton Mitsubishi Alliance, manager (BHP Billiton Ltd., 50%, and Mitsubishi Development Pty. Ltd., 50%)	Blackwater open pit coal mine (includes South Blackwater), 195 km W of Rockhamton, QLD	13,500
Do.	Xstrata Coal Australia Pty. Ltd., manager (Oakbridge Pty. Ltd., 87.5%, and Nippon Steel Australia Pty. Ltd., 12.5%)	Bulga open pit/longwall coal mine, 16 km SW of Singleton, NSW	11,000
Do.	Pacific Coal Pty. Ltd., 57.195% and manager [Leichhardt Coal Pty. Ltd., 31.419%; EPDC (Australia) Pty. Ltd., 7.9723%; and Japan Coal Development Co. Ltd., 3.416%]	Blair Athol open pit coal mine, 110 km NW of Emerald, 25 km NW of Clermont, QLD	11,000
Do.	Bloomfield Collieries Pty. Ltd., 100%	Bloomfield open pit coal mine, 20 km NW of Newcastle, 5 km SE of Maitland, NSW	1,300
Do.	Anglo Coal Holdings Australia Ltd., 100%	Boundary Hill open pit coal mine (includes Callide), 115 km to 140 km W of Gladstone, QLD	7,250
Do.	RAG Australia Pty. Ltd., manager (Burton Coal Pty. Ltd., 95%, and Thiess Pty. Ltd., 5%)	Burton open pit coal mine, 150 km SW of Mackay, QLD	5,800
Do.	Camberwell Coal Pty. Ltd., manager [Toyota Tsusho Mining (Australia) Pty. Ltd., 90%, and Dia Coal Mining (Australia) Pty. Ltd., 10%]	Camberwell open pit coal mine, 10 km NW of Singleton, NSW	4,000
Do.	LakeCoal Pty. Ltd., 80%, manager; Catherine Hill Resources Pty. Ltd., 20%	Chain Valley underground coal mine, 48 km S of Newcastle, NSW	3,000
Do.	Centennial Coal Co. Ltd., 85%, manager; SK Australia Pty. Ltd., 15%	Clarence underground coal mine, 10 km E of Lithgow, NSW	2,200
Do.	Roche Mining Pty. Ltd., operator (Millmerran Power Partners, 100%)	Commodore open pit coal mine, 80 km S of Toowoomba, QLD	3,600
Do.	Xstrata Coal Australia Pty. Ltd., 50%; Centennial Coal Co. Ltd., 45%; Tokyo Boeki Ltd., 5%	Cook underground coal mine, near Blackwater, QLD	1,000
Do.	Powercoal Pty. Ltd., 100%, manager	Cooranbong underground coal mine, 35 km SW of Newcastle, NSW	1,600
Do.	Australian Premium Coals Pty. Ltd., manager (Macarthur Coal Ltd., 45%; QCR No. 2 Pty. Ltd., 20%; CPB Coals Pty., 10%; Citic Australia Coal Ltd., 5%; Marubeni Coal Pty. Ltd., 7.5%; Nissho Iwai Australia Ltd., 7.5%; Kawasho Group, 3%; Nittetsu Shoji, 2%)	Coppabella open pit coal mine, 150 km SW of Mackay, QLD	4,700
Do.	BHP Billiton Mitsubishi Alliance, manager (BHP Billiton Ltd., 50%, and Mitsubishi Development Pty. Ltd., 50%)	Crinum longwall coal mine, 45 km NE of Emerald, QLD	4,000
Do.	Cumnock No. 1 Colliery Pty. Ltd., 100%	Cumnock No. 1 open pit/longwall coal, 28 km NW of Singleton, NSW	2,750
Do.	Curragh Queensland Mining Ltd., 100%	Curragh open pit coal mine, 70 km E of Emerald, QLD	5,000
Do.	Anglo Coal Holdings Australia Ltd., 93%, and Ssangyong Resources Ltd., 7%	Dartbrook longwall coal mine, 70 km N of Singleton, NSW	3,750
Do.	BHP Billiton Ltd., 100%	Dendrobium longwall coal mine, 15 km SW of Wollongong, NSW	5,200
Do.	Anglo Coal Holdings Australia Ltd., 88.2% and manager; Mitsui Coal Development Australia Pty. Ltd., 3.8%; Mitsui Mining (Australia) Pty. Ltd., 3%; Daesung Australia Pty. Ltd., 2.5%; and Hyundai (Australia) Pty. Ltd., 2.5%	Drayton open pit coal mine, 35 km NW of Singleton, NSW	5,000

See footnotes at end of table.

TABLE 2--Continued
 AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2003

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities ^{1,2}	Annual capacity ^e
Coal, black--Continued:	Ebenezer Mining Co., 100%	Ebenezer open pit coal mine, 40 km SW of Brisbane, QLD	1,500
Do.	BHP Steel (AIS) Pty. Ltd.	Elouera longwall coal mine, 15 km SW of Wollongong, NSW	2,000
Do.	Idemitsu Kosan Co. Ltd., 85%; EPDC (Australia) Pty. Ltd., 10%; LG International (Australia) Pty. Ltd., 5%	Ensham-Yongala open pit coal mine, 40 km NE of Emerald, QLD	5,500
Do.	Griffin Coal Mining Co. Pty. Ltd., 100%	Ewington II open pit coal mine, 8 km E of Collie, WA	1,000
Do.	CAML Resources Pty. Ltd., 63%; Itochu Corp., 20.6%; Bowen Basin Investments Pty. Ltd., 16.4%	Foxleigh open pit coal mine, Bowen Basin, QLD	2,300
Do.	Anglo Coal Holdings Australia Ltd., 100% of German Creek and 75.04% of German Creek East; Marubeni Coal Pty. Ltd., 24.96% of German Creek East	German Creek and German Creek East open pit/longwall coal mines, 275 km WNW of Rockhampton, QLD	6,000
Do.	Console Energy Inc., 50% and Namoi Hunter Pty. Ltd., 50%	Glennies Creek longwall coal mine, 12 km N of Singleton, NSW	2,500
Do.	BHP Billiton Ltd., 80% at Riverside and 50% at Goonyella; Mitsubishi Corp., 50% at Goonyella; BHP Mitsui Coal Pty. Ltd., 20% at Riverside	Goonyella-Riverside open pit coal mines, 140 km SW of Mackay, QLD	11,000
Do.	BHP Billiton Mitsubishi Alliance, manager (BHP Billiton Ltd., 50%, and Mitsubishi Development Pty. Ltd., 50%)	Gregory open pit coal mine, 60 km N of Emerald, QLD	5,500
Do.	Coal and Allied Industries Ltd., 100% and manager	Hunter Valley Operations (includes Carrington Chestnut, Howick, Hunter Valley No. 1, Lemington, Riverview open pit coal mines), 10 km W to 25 km N of Singleton, NSW	15,000
Do.	New Hope Corp. Ltd., 100%	Jeebropilly open pit coal mine, 35 km SW of Brisbane, QLD	1,500
Do.	Queensland Coal Mine Management Pty. Ltd., 70%; Winnin Pty. Ltd., 15%; Marubeni Coal Pty. Ltd., 15%	Jellinbah East open pit coal mine, 90 km E of Emerald, QLD	3,000
Do.	Pacific Coal Pty. Ltd., 80%, and Kestrel Coal Investment Pty. Ltd., 20%	Kestrel longwall coal mine, 40 km NNE of Emerald, QLD	3,300
Do.	Xstrata Coal Australia Pty. Ltd., 67%, and Mitsui Matsushima Australia Pty. Ltd., 32.5%	Liddell open pit coal mine, 25 km NW of Singleton, NSW	4,000
Do.	Burratorang Valley Coal Pty. Ltd., 100%	Metropolitan longwall coal mine, 30 km N of Wollongong, NSW	1,400
Do.	LakeCoal Pty. Ltd., 80%, and Catherine Hill Resources Pty. Ltd., 20%	Moonee longwall coal mine, 37 km S of Newcastle, NSW	1,200
Do.	Anglo Coal Holdings Australia Ltd., 88%; Nippon Steel Australia Pty. Ltd., 5%; Tomen Coal Resources Pty. Ltd., 3.75%; private interests, 3.25%	Moranbah North longwall coal mine, 150 km SW of Mackay, QLD	5,700
Do.	Hunter Valley Coal Corp., 100%	Mount Owen open pit coal mine, 20 km NW of Singleton, near Ravensworth, NSW	8,000
Do.	Coal and Allied Industries Ltd., 80%, and Pohang Steel Australia Pty. Ltd., 20%	Mount Thorley open pit coal mine, 14 km SW of Singleton, NSW	6,500
Do.	Mitsui & Co. (Australia) Ltd., 100%	Moura open pit coal mine, 185 km W of Gladstone, QLD	4,400
Do.	The Griffin Coal Mining Co. Pty. Ltd., 100%	Muja open pit coal mine, 18 km SE of Collie, WA	2,000
Do.	Powercoal Pty. Ltd., 100%	Munmorah underground coal mine, 55 km S of Newcastle, NSW	7,000
Do.	Muswellbrook Coal Co., 100%	Muswellbrook No. 2 open pit coal mine, 4 km NE of Muswellbrook, Hunter Valley NSW	1,700
Do.	Powercoal Pty. Ltd., 100%	Myuna underground coal mine, 35 km S of Newcastle, NSW	1,500
Do.	Nardell Coal Corp., 100%	Nardell underground coal mine, 18 km NW of Singleton, NSW	1,200
Do.	MIM Holdings Ltd., manager (Collinsville Coal Co. Pty. Ltd., 75%, and Itochu Coal Resources Australia Pty. Ltd., 25%)	Newlands-Collinsville-Abbot Point open pit/longwall coal mine, 130 km west of Mackay, QLD	7,000
Do.	Powercoal Pty. Ltd., 100% and manager	Newstan longwall coal mine, 30 km SW of Newcastle, NSW	2,700

See footnotes at end of table.

TABLE 2--Continued
 AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2003

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities ^{1,2}	Annual capacity ^e
Coal, black--Continued:	Rag Coal International AG, 40%, and Thiess Pty. Ltd., 40%	North Goonyella longwall coal mine, 180 km W of Mackay, QLD	3,000
Do.	BHP Billiton Ltd., 50%, and Mitsubishi Corp., 50%	Norwich Park open pit coal mine, 85 km NNE of Emerald, QLD	4,000
Do.	Oaky Creek Coal Pty. Ltd., 75%; Sumitomo Coal Australia Pty. Ltd., 15%; Itocho Coal Resources Australia Pty. Ltd., 10%, of Oaky Creek; Namoi Highwall Pty. Ltd., 50%, and Sumitomo Coal Australia Pty. Ltd., 50%, of Alliance	Oaky Creek longwall and Alliance open pit coal mines, 300 km WNW of Rockhampton, QLD	9,500
Do.	BHP Billiton Ltd., 50%, and Mitsubishi Development Pty. Ltd., 50%	Peak Downs open pit coal mine, 145 km N of Emerald, QLD	7,500
Do.	Wesfarmers Premier Coal Ltd., 100%	Premier open pit coal mine, 10 km SE of Collie, WA	4,000
Do.	Xstrata Coal Australia Pty. Ltd., 100% of Ravensworth and 50% at Narama; Iluka Resources Ltd., 50% at Narama	Ravensworth-Narama open pit coal mine (includes Ravensworth East), at Lemington, 20 km NW of Singleton, NSW	6,200
Do.	Bloomfield Colliers Pty. Ltd., 100%	Rixs Creek open pit coal mine, 5 km NW of Singleton, NSW	2,000
Do.	BHP Mitsui Coal Pty. Ltd., 100%	South Walker Creek open pit-underground coal mine, 90 km SW of Mackay, 20 km W of Nebo, QLD	3,500
Do.	BHP Billiton Ltd., 50%, and Mitsubishi Development Pty. Ltd., 50%	Saraji open pit coal mine, 125 km N of Emerald, QLD	5,000
Do.	Southland Coal Pty. Ltd., 90%, and Thiess Pty. Ltd., 10%	Southland longwall coal mine, 40 km W of Newcastle, NSW	2,000
Do.	G.C. Springvale Pty. Ltd., 50%, and Samsung Development (Australia) Pty. Ltd., 50%	Springvale longwall coal mine, 16 km NW of Lithgow, NSW	2,000
Do.	Austral Coal Ltd., 100%	Tahmoor longwall coal mine (includes Tahmoor North and Bargo), near Picton, about 70 km SW of Sydney, NSW	2,000
Do.	Pacific Coal Pty. Ltd., 100%	Tarong-Meandu open pit coal mine, 85 km N of Toowoomba, QLD	5,500
Do.	BHP Steel (AIS) Pty. Ltd., 100%	Tower longwall coal mine, 32 km NW of Wollongong, NSW	2,000
Do.	Ulan Coal Mines Ltd., 10%, and Mitsubishi Development Pty. Ltd., 10%	Ulan open pit-longwall coal mine, 45 km NW of Mudgee, NSW	12,000
Do.	Xstrata Coal Australia Pty. Ltd., 95%, and United Mine Workers, 5%	United Collieries underground coal mine, 15 km W of Singleton, NSW	1,600
Do.	Wambo Coal Pty. Ltd., 100%	Wambo longwall coal mine, 15 km W of Singleton, NSW	3,100
Do.	Coal and Allied Industries, Ltd., 55.574%; Mitsubishi Coal Development Pty. Ltd., 28.898%; Nippon Steel Australia Pty. Ltd., 9.528%; Mitsubishi Corp., 6%	Warkworth open pit coal mine, 11 km SW of Singleton, NSW	6,400
Do.	BHP Steel (AIS) Pty. Ltd., 100%	West Cliff longwall coal mine, 43 km NW of Wollongong, NSW	3,000
Do.	Oceanic Coal Australia Ltd., 70%; Marubeni Coal Pty. Ltd., 17%; Ocal Macquarie Pty. Ltd., 10%; Kokan Kogyo (Australia) Pty. Ltd., 3%	West Wallsend longwall coal mine, 25 km SW of Newcastle, NSW	3,000
Do.	Powercoal Pty. Ltd., 100%	Wye longwall coal mine, 40 km S of Newcastle, NSW	1,200
Coal, brown	Alcoa World Alumina Australia, 100%	Anglesea open pit lignite mine, 97 km SW of Melbourne, near Geelong, VIC	1,200
Do.	Hazelwood Power, 100%	Hazelwood open pit lignite mine at Morwell, 150 km SE of Melbourne, VIC	19,500
Do.	Loy Yang Power Ltd., 100%	Loy Yang open pit lignite mine at Traralgon, 165 km E of Melbourne, VIC	32,000
Do.	Auspower Pty. Ltd., 73.6%; Powergen Plc., 18.4%; Deutsche Asset Management, 8%	Yallourn open pit lignite mine, 140 km SE of Melbourne, VIC	18,500
Cobalt	Preston Resources Ltd., 100%	Bulong open pit nickel-cobalt mine, 30 km E of Kalgoorlie, WA	0.1

See footnotes at end of table.

TABLE 2--Continued
 AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2003

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities ^{1,2}	Annual capacity ^e
Cobalt--Continued:	OM Group Inc., 100%	Cawse open pit nickel-cobalt mine, 50 km NW of Kalgoorlie, WA	0.2
Do.	Anaconda Nickel Ltd., 60%, manager; Glencore Australia Pty. Ltd. International AG, 40%	Murrin Murrin open pit nickel-cobalt mine, 60 km E of Leonora, WA	0.1
Do.	Australian Nickel Mines NL, 100%	Radio Hill underground nickel-cobalt mine, 100 km ESE of Karratha, WA	0.2
Do.	QNI Pty. Ltd., 100%	Yabulu nickel-cobalt refinery, Townsville, QLD	2
Copper	Newcrest Mining Ltd., 100%	Cadia Hill open pit gold-copper mine, 21 km SSW of Orange, NSW	25
Do.	Glencore Australia Pty. Ltd., 100%	Cobar underground copper mine, 10 km NW of Cobar, NSW	30
Do.	Amalg Resources NL, 100%	Eloise underground copper mine, 60 km SE of Cloncurry, QLD	70
Do.	MIM Holdings Ltd., 51%, and Westpac Banking Corp., 49%	Ernest Henry open pit copper-gold mine, 35 km NE of Cloncurry, QLD	105
Do.	Murchison Zinc Co. Pty. Ltd., 100%	Golden Grove underground zinc-copper mine (includes Gossan Hill and Scuddles), 225 km E of Geraldton, WA	6
Do.	Thalanga Copper Mines Pty. Ltd., 70%, and BML Holdings Pty. Ltd., 30%	Highway-Reward open pit and underground copper mine, 37 km S of	185
Do.	Western Metals Ltd., 100%	Hellyer underground zinc-lead-copper-silver mine, 80 km SSW of Burnie, TAS	1
Do.	Copper Refineries Pty. Ltd., operator (MIM Holdings Ltd., 100%)	MIM copper refinery, Townsville, QLD	270
Do.	MIM Holdings Ltd., 100%	MIM copper smelter, QLD	250
Do.	Matrix Metals Ltd., 100%	Mount pithbert open pit mine (includes Mount Watson), 90 km NW of Cloncurry, QLD	8
Do.	Western Metals Ltd., 100%	Mount Gordon open pit copper mine (includes Esperanza and Mammoth), 125 kilometers N of Mount Isa	46
Do.	MIM Holdings Ltd., 100%	Mount Isa underground copper-lead-zinc-silver mine (also includes Enterprise, George Fisher, and Hilton mines) at Mount Isa, QLD	275
Do.	Copper Mines of Tasmania Pty. Ltd., 100%	Mount Lyell underground copper-gold mine, 2 km NE of Queenstown, TAS	35
Do.	Straits (Nifty) Pty. Ltd., 100%	Nifty open pit copper mine, 200 km SE of Marble Bar, WA	22
Do.	Rio Tinto Ltd., 80%; Sumitomo Metal Mining Oceania Pty. Ltd., 13.3%; SC Mineral Resources Pty. Ltd., 6.7%	Northparkes open pit/underground copper-gold mine, 27 km N of Parkes, NSW	55
Do.	WMC Olympic Dam Operations Pty. Ltd., 100%	Olympic Dam underground copper-silver-gold-uranium mine at Roxby Downs. 80 km N of Woomera, SA	220
Do.	do.	Olympic Dam copper refinery, SA	220
Do.	do.	Olympic Dam copper smelter, SA	70
Do.	Placer Dome Asia Pacific Ltd., 100%	Osborne underground copper-gold mine, 195 km SE of Mount Isa, QLD	50
Do.	Peak Gold Mines Pty. Ltd., 100%	Peak underground gold-zinc-lead-copper-silver underground mine (includes New Cobar, New Occidental, and Perseverance), 8 km S of Cobar, NSW	3
Do.	Furukawa Co. Ltd., 52.5%; Nittetsu Mining Co., 20%; Nissho Iwai Corp., 17.5%; Itochu Corp., 10%	Port Kembla copper refinery, NSW	120
Do.	do.	Port Kembla copper smelter, NSW	120
Do.	Newcrest Mining Ltd., 100%	Ridgeway underground gold-copper mine, 25 km S of Orange, NSW	30
Do.	Pasminco Ltd., 100%	Rosebery underground zinc-lead-silver-copper-gold mine, 35 km N of Queenstown, TAS	1

See footnotes at end of table.

TABLE 2--Continued
 AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2003

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners		Location of main facilities ^{1,2}	Annual capacity ^e
Copper--Continued:		Selwyn Mines Ltd., 100%		Selwyn underground copper-gold mine, 150 km SE of Mount Isa, QLD	17
Diamond	thousand carats	Rio Tinto Ltd., 100%		Argyle Mine (AK-1 lamproite pipe and alluvial diamond mines), 120 km SW of Kununurra, WA	26,000
Do.	do.	do.		Merlin open pit diamond mine, 80 km S of Borroloola, NT	55
Diatomite		Australian Diatomite Mining Pty. Ltd., 100%		Barraba open pit diatomite mine, 85 km km NNW of Tamworth, NSW	25
Dolomite		OneSteel Ltd., 100%		Ardrossan metallurgical dolomite quarry, Northern York Peninsula, SA	650
Feldspar		Minerals Corp. Ltd., 100%		Triple Chance open pit feldspar mine (includes Lady Beryl, Bakers, and Spar Ridge), 42 km SW of Broken Hill, NSW	15
Garnet		GMA Garnet Pty. Ltd., 100%		Port Gregory open pit industrial garnet mine, 100 km N of Geraldton, WA	200
Gas, condensate	thousand 42-gallon barrels per day	Woodside Petroleum Pty. Ltd., manager [BHP Petroleum Pty. Ltd., BP Australia Holdings Ltd., Chevron Asiatic Ltd., Japan Australia LNG (MIMI) Pty. Ltd., Shell Development (Australia) Pty. Ltd., and Woodside Petroleum Ltd., 16.67% each]		North West Shelf gas operations, 130 km offshore from Dampier, WA	60
Gas, natural	million cubic meters per day	Woodside Petroleum Pty. Ltd., manager [BHP Petroleum Pty. Ltd., BP Australia Holdings Ltd., Chevron Asiatic Ltd., Japan Australia LNG (MIMI) Pty. Ltd., Shell Development (Australia) Pty. Ltd., and Woodside Petroleum Ltd., 16.67% each]		North West Shelf gas operations, 130 km offshore from Dampier, WA	20
Gas, liquefied natural	million tons	do.		Three-train liquefaction plant, Burrup Peninsula, WA	8
Gold	kilograms	Gold Fields Ltd. (South Africa), 100%		Agnew open pit-underground gold mine, 23 km W of Leinster, WA	5,600
Do.	do.	New Hampton Goldfields Ltd., 100%		Big Bell Consolidated open pit/underground gold mine (includes Big Bell, Black Swan, Cuddingwarra, Great Fingall, Golden Crown, and Tuckabianna): Big Bell, 30 km WNW of Cue; Cuddingwarra, 10 km WNW of Cue; Golden Crown, 7 km S of Cue, WA	7,000
Do.	do.	Worsley Alumina Pty. Ltd., operator (Newmont Mining Corp., 44.45%; AngloGold Ltd., 33.33%; Newcrest Mining Ltd., 22.22%)		Boddington open pit/underground gold mine (includes Wandoo and Hedges), 150 km SE of Perth, WA 3/	12,000
Do.	do.	Normandy Yandal Operations Ltd., 100%		Bronzewing underground gold mine (includes Mount McClure), 65 km NE of Leinster, WA	9,000
Do.	do.	Newcrest Mining Ltd., 100%		Cadia Hill open pit gold-copper mine, 21 km SSW of Orange, NSW	11,000
Do.	do.	MIM Holdings Ltd., 51%, and Westpac Banking Corp., 49%		Ernest Henry open pit copper-gold mine, 35 km NE of Cloncurry, QLD	3,000
Do.	do.	Kalgoorlie Consolidated Gold Mines Pty. Ltd., 100%		Gidji Roaster gold smelter, Kalgoorlie, WA	24,250
Do.	do.	Normandy NFM Ltd., 100%		Granites-Dead Bullock Soak open pit/underground gold mine, 550 km NW of Alice Springs, in the Tanami Desert, NT	7,000
Do.	do.	Placer Dome Asia Pacific Ltd., manager (Placer Dome Inc., 60%, and Delta Gold Ltd., 40%)		Granny Smith open pit gold mine (includes Sunrise and Wallaby), 20 km S of Laverton, WA	16,000
Do.	do.	AuronGold Ltd., 100%		Henty underground gold-silver mine, 30 km N of Queenstown, TAS	3,700
Do.	do.	Thalanga Copper Mines Pty. Ltd., 70%, and BML Holdings Pty. Ltd., 30%		Highway-Reward open pit and underground copper mine, 37 km S of Charters Towers, QLD	1,000
Do.	do.	New England Antimony Mines NL, 100%		Hillgrove underground antimony-gold mine, 25 km E of Armidale, NSW	1,000
Do.	do.	Newmont Yandal Operations Ltd., 100%		Jundee-Nimary open pit/underground gold mine, 45 km NE of Wiluna, WA	12,000

See footnotes at end of table.

TABLE 2--Continued
 AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2003

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities ^{1,2}	Annual capacity ^e
Gold--Continued: kilograms	AurionGold Ltd., 100%	Kanowna Belle underground gold mine, 18 km NE of Kalgoorlie, WA	7,000
Do.	do. Barrack Gold Corp., 100%	Lawlers underground gold mine, 30 km SW of Leinster, WA	3,000
Do.	do. Sons of Gwalia Ltd., 100%	Marvel Loch Operations open pit-underground gold mines approximately 30 km SE of Southern Cross, WA	10,000
Do.	do. Saint Barbara Mines Ltd., 100%	Meekatharra open pit mine-underground gold mine, 20 km S of Meekatharra, WA	4,000
Do.	do. Copper Mines of Tasmania Pty. Ltd., 100%	Mount Lyell underground copper-gold mine, 2 km NE of Queenstown, TAS	1,000
Do.	do. Harmony Gold Mining Co. Ltd., 100%	Mount Magnet open pit/underground gold mine (includes Hill 50 and Star), 2 km from Mount Magnet, WA	8,500
Do.	do. Australian Gold Refineries, 100% (State of WA agency)	Newburn gold refinery, WA	246,000
Do.	do. Croesus Mining NL, 100%	Norseman underground gold mine at Norseman, WA	3,700
Do.	do. Rio Tinto Ltd., 80%; Sumitomo Metal Mining Oceania Pty. Ltd., 13.3%; SC Mineral Resources Pty. Ltd., 6.7%	Northparkes open pit/underground copper-gold mine, 27 km N of Parkes, NSW	155,000
Do.	do. Placer Dome Asia Pacific Ltd., 100%	Osborne underground copper-gold mine,	1,500
Do.	do. WMC Olympic Dam Operations Pty. Ltd., 100%	Olympic Dam underground copper-silver-gold-uranium mine at Roxby Downs. 80 km N of Woomera, SA	1,500
Do.	do. MIM Holdings Ltd., 100%	Pacific precious metals refinery, NSW	1,900
Do.	do. Paddington Gold Pty. Ltd., 100%	Paddington open pit gold-silver mine, 35 km NW of Kalgoorlie, WA	2,800
Do.	do. Newmont Pajingo Pty. Ltd., 100%	Pajingo underground gold mine (includes Vera-Nancy), 60 km SSE of Charters Towers, QLD	6,400
Do.	do. Peak Gold Mines Pty. Ltd., 100%	Peak underground gold-zinc-lead-copper-silver underground mine (includes New Cobar, New Occidental, and Perseverance), 8 km S of Cobar, NSW	350,000
Do.	do. Alkane Exploration Ltd., 100%	Peak Hill open pit gold mine, 50 km N of Parkes, NSW	700,000
Do.	do. Australian Gold Refineries, 100% (State of WA agency)	Perth Refinery (Newburn), WA	95,000
Do.	do. Homestake Mining Co., 100%	Plutonic open pit/underground gold mine, (includes Freshwater), 180 km NE of Meekatharra, WA	8,000
Do.	do. Carpentaria Gold Pty. Ltd., 50.1%, and Haoma Mining NL, 49.9%	Ravenswood open pit mine (includes Nolans, Sarsfield, and Mount Wright), 100 km S of Townsville, QLD	3,000
Do.	do. Newcrest Mining Ltd., 100%	Ridgeway underground gold-copper mine, 25 km S of Orange, NSW	10,800
Do.	do. Pasminco Ltd., 100%	Rosebery underground zinc-lead-silver-copper-gold mine, 35 km N of Queenstown, TAS	1,000
Do.	do. Gold Fields Ltd., 100%	Saint Ives open pit/underground gold mine, 75 km SSE of Kalgoorlie, WA	15,000
Do.	do. Selwyn Mines Ltd., 100%	Selwyn underground copper-gold mine, 150 km SE of Mount Isa, QLD	700
Do.	do. Sons of Gwalia Ltd., 100%	Sons of Gwalia open pit/underground gold mine (includes Red October, Harlech, McGraths, Kailis, and Anchor), 5 km W of Leonora, WA	6,000
Do.	do. MPI Gold Pty. Ltd., 50%, and Pittston Mineral Ventures of Australia Pty. Ltd., 50%	Stawell underground gold mine, 240 km W of Melbourne, VIC	3,000
Do.	do. AngloGold Ltd., 100%	Sunrise Dam open pit mine gold (includes Cleo), 55 km S of Laverton, WA	8,000

See footnotes at end of table.

TABLE 2--Continued
 AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2003

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities ^{1,2}	Annual capacity ^c
Gold--Continued: kilograms	Kalgoorlie Consolidated Gold Mines Pty. Ltd., manager (Barrick Gold Corp., 50%, and Newmont Mining Ltd., 50%)	Super Pit open pit gold mine (includes Fimiston), SE corner of the Kalgoorlie-Boulder Township, WA	20,000
Do.	do. Otter Gold Mines Ltd., 60%, and AngloGold Ltd., 40%	Tanami open pit gold mine (includes Central Desert Joint Venture), 650 km NW of Alice Springs, NT	2,800
Do.	do. PacMin Mining Corp., 100%	Tarmoola open pit gold mine, 29 km NW of Leonora, WA	6,500
Do.	do. AngloGold Ltd., 100%	Union Reefs open pit gold mine, 12 km N of Pine Creek, NT	3,000
Do.	do. Wiluna Mines Ltd., 100%	Wiluna open pit/underground gold mine, 7 km S of Wiluna, WA	3,300
Gypsum	Gypsum Resources Australia Pty. Ltd., 100%	Lake MacDonnell open pit gypsum mine, near Point Thevenard, SA	1,400
Do.	Dampier Salt Ltd., 100%	Lake MacLeod salt and gypsum solar evaporation ponds, 65 km N of Carnarvon, WA	900
Iron ore	Hamersley Iron Pty. Ltd., 60%, and China Iron and Steel Industry & Trade Group Corp. (a Chinese Government agency), 40%	Channar open pit iron ore mine, 70 km S of Tom Price, WA	11,000
Do.	BHP Billiton Ltd., 100%	Cockatoo Island open pit iron ore mine, 130 km NNE of Derby, WA	1,050
Do.	Hamersley Iron Pty. Ltd., 100%	Hamersley Operations (includes Brockman No. 2, Marandoo, Mount Tom Price, Nammuldi, Paraburdoo, and Yandicoogina open pit iron ore mines), 30 km to 85 km NE, NW, and S of Tom Price, WA	60,000
Do.	BHP Minerals Pty. Ltd., 100%	Jimblebar open pit iron ore mine, 40 km E of Newman, WA	6,000
Do.	Portman Ltd., 100%	Koolyanobbing Central open pit iron ore mine, 50 km NNE of Southern Cross, WA	3,000
Do.	BHP Iron Ore Pty. Ltd., 85%, manager; CI Minerals Australia Pty. Ltd., 8%; Mitsui Iron Ore Corp. Pty. Ltd., 7%	Mount Goldsworthy open pit iron ore mine (includes Yarrarie), 180 km E of Port Hedland, WA	8,000
Do.	Imdex Ltd., 100%	Mount Gould open pit iron ore mine, 160 km W of Meekatharra, WA	6,000
Do.	BHP Iron Ore Pty. Ltd., 85%; Mitsui Itochu Iron Pty. Ltd., 10%; CI Minerals Australia Pty. Ltd., 5%	Mount Newman (includes Mount Whaleback, Orebody 23-25, Orebody 29, and Orebody 30-35) open pit iron ore mines, within 13 km of Newman, WA	25,000
Do.	Robe River Iron Associates, manager (Rio Tinto Ltd., 53%; Mitsui & Co. (Australia) Ltd., 33%; Nippon Steel Australia Pty. Ltd., 10.5%; Sumitomo Metal Australia Pty. Ltd., 3.5%)	Pannawonica (includes Mesa J) open pit iron ore mine, 130 km SSW of Dampier WA	31,000
Do.	ABM Mining Ltd., 100%	Savage River open pit iron ore mine (includes Long Plains), 100 km SW of Burnie, TAS	2,400
Do.	OneSteel Ltd., 100%	Whyalla open pit iron ore mines, 270 km NW of Adelaide, SA	2,600
Do.	BHP Minerals Pty. Ltd., 55%; Pilbara Iron Pty. Ltd., 30%; CI Minerals Australia Pty. Ltd., 8%; Mitsui Iron Ore Corp. Pty. Ltd., 7%	Yandi open pit iron ore mine, 92 km N of Newman, WA	35,000
Kaolin	Osterfield Pty. Ltd., 100%	Axedale Clays open pit kaolin mine, 18 km E of Bendigo, VIC	50
Do.	Queensland Kaolin Pty. Ltd., 96.6%, and private interests, 3.4%	Skardon River open pit kaolin mine, 85 km N of Weipa, QLD	150

See footnotes at end of table.

TABLE 2--Continued
 AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2003

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities ^{1,2}	Annual capacity ^c
Lead	Perilya Ltd., 100%	Broken Hill underground silver-zinc-lead mine at Broken Hill, NSW	90
Do.	BHP Minerals Ltd., 100%	Cannington underground silver-lead-zinc mine, 200 km SE of Mount Isa, QLD	265
Do.	Pasminco Century Mine Ltd., 100%	Century open pit zinc-silver-lead mine, 250 km NW of Mount Isa, QLD	70
Do.	Pasminco Ltd., 100%	Cockle Creek lead smelter, NSW	35
Do.	do.	Elura underground zinc-silver-lead mine, 40 km NW of Cobar, NSW	45
Do.	Western Metals Ltd., 100%	Hellyer underground zinc-lead-copper-silver mine, 80 km SSW of Burnie, TAS	44
Do.	do.	MIM lead smelter, QLD	160
Do.	MIM Holdings Ltd., 100%	Mount Isa underground copper-lead-zinc-silver mine (also includes enterprise, George Fisher, and Hilton mines) at Mount Isa, QLD	150
Do.	do.	Mount Isa Smelter, QLD	240
Do.	Peak Gold Mines Pty. Ltd., 100%	Peak underground gold-zinc-lead-copper-silver underground mine (includes New Cobar, New Occidental, and Perseverance), 8 km S of Cobar, NSW	5
Do.	Pasminco Ltd., 100%	Port Pirie lead smelter, SA	250
Do.	do.	Rosebery underground zinc-lead-silver-copper-gold mine, 35 km N of Queenstown, TAS	23
Magnesite	Australian Magnesium Corp. Ltd., 100%	Kunwarara open pit magnesite mine (includes Marlborough), 70 km NW of Rockhampton, QLD	3,000
Manganese	Groote Eylandt Mining Co. Pty. Ltd., 100%	Groote Eylandt open pit manganese mine at Groote Eylandt, NT	2,400
Do.	Pilbara Manganese Pty. Ltd., 100%	Woodie Woodie open pit manganese mine (includes Bells and East Pilbara leases), 400 SE of Port Hedland, WA	350
Manganese alloys	Tasmanian Electro Metallurgical Co. Pty. Ltd., 100%	Bell Bay Smelter near Launceston, TAS	260
Mineral sands	Iluka Resources Ltd., 100%	Eneabba open pit heavy-mineral sands mine, 260 km N of Perth, WA	NA
Do.	Mineral Deposits Ltd., 100%	Hawks Nest heavy-mineral sands dredge, 50 km NE of Newcastle, NSW	NA
Do.	Cable Sands (WA) Pty. Ltd., 100%	Jangardup heavy-mineral sands dredge, 50 km S of Nannup, WA	NA
Do.	Iluka Resources Ltd., 100%	North Capel open pit heavy-mineral sands mine, 7 km N of Capel, WA	NA
Do.	Stradbroke Rutile Pty. Ltd., 100%	North Stradbroke Island heavy-mineral sands dredge, 35 km E of Brisbane, QLD	NA
Do.	KMCC Western Australia Pty. Ltd., 50%, and Ticor Resources Pty. Ltd., 50%	Tiwest Joint Venture heavy-mineral sands dredge, 180 km N of Perth, WA	NA
Do.	Murray Basin Titanium Pty. Ltd., 100%	Wemen heavy-mineral sands dredge, 80 km SE of Mildura, VIC	NA
Nickel	Outokumpu Exploration Ventures Pty. Ltd., 100%	Black Swan underground nickel mine (includes Silver Swan), 53 km NE of Kalgoorlie, WA	22
Do.	Preston Resources Ltd., 100%	Bulong open pit nickel-cobalt mine, 30 km E of Kalgoorlie, WA	9
Do.	OM Group Inc., 100%	Cawse open pit nickel-cobalt mine, 50 km NW of Kalgoorlie, WA	9
Do.	Jubilee Mines NL, 100%	Cosmos open pit nickel mine, 50 km N of Leinster, WA	80
Do.	WMC Ltd., 100%	Kalgoorlie nickel smelter, Kalgoorlie, WA	100

See footnotes at end of table.

TABLE 2--Continued
 AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2003

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities ^{1,2}	Annual capacity ^e
Nickel--Continued:		WMC Ltd., 100%	Kambalda underground nickel mines, 25 km N of Kambalda to 10 km S of Widgiemooltha, WA	35
Do.		do.	Kwinana nickel refinery, Kwinana, WA	67
Do.		do.	Leinster open pit-underground nickel mines, 10 km N of Leinster, WA	44
Do.		Mincor Resources NL, 76%; Clough Mining Pty. Ltd., 12%; and Donegal Resources Pty. Ltd., 12%	Mittel underground nickel mine (includes Redross and Mariners), 70 km S of Kambalda, WA	10
Do.		WMC Ltd., 100%	Mount Keith open pit nickel mine (includes Cliffs and Yakabindie), 70 km SSE of Wiluna, WA	50
Do.		Anaconda Nickel Ltd., 60%, and Glencore International AG, 40%	Murrin Murrin nickel refinery, Murrin Murrin, WA	45
Do.		do.	Murrin Murrin open pit nickel-cobalt mine, 60 km E of Leonora, WA	100
Do.		Australian Nickel Mines NL, 100%	Radio Hill underground nickel-cobalt mine, 100 km ESE of Karratha, WA	4
Do.		QNI Pty. Ltd., 100%	Yabulu nickel-cobalt refinery, Townsville, QLD	30
Opal		Many small producers	Andamooka and Coober Pedy areas, SA; Lightning Ridge area, NSW	NA
Petroleum	thousand 42-gallon barrels per day	Exxon Mobil Corp., 100%	Altona Refinery, VIC	120
Do.	do.	BP Amoco Refinery (Bulwer Island) Pty. Ltd., 100%	Bulwer Island Refinery, QLD	69.3
Do.	do.	Shell Refining (Australia) Pty. Ltd., 100%	Clyde Refinery, NSW	85
Do.	do.	do.	Geelong Refinery, VIC	110
Do.	do.	ChevronTexaco Corp., 100%	Kurnell Refinery, NSW	114
Do.	do.	BP Amoco Refinery (Kwinana) Pty. Ltd., 100%	Kwinana Refinery, WA	138
Do.	do.	ChevronTexaco Corp., 100%	Lytton Refinery, QLD	105.5
Do.	do.	Exxon Mobil Corp., 100%	Port Stanvac Refinery, SA	69
Phosphate rock		WMC Fertilizers Ltd., 100%	Phosphate Hill-Duchess open pit phosphate mine, 140 km NW of Mount Isa, QLD	2,200
Salt		Dampier Salt Ltd., 100%	Dampier solar evaporation salt pans, 65 km N of Carnarvon, WA	5,000
Do.		do.	Lake MacLeod solar salt and gypsum evaporation pans, 65 km N of Carnarvon, WA	900
Do.		do.	Port Hedland solar salt fields, at Port Hedland, WA	3,000
Silica		Itochu Corp., 50%, and Tochu Corp., 50%	Kemerton silica sands dredge, 25 km NE of Bunbury, WA	450
Silver	kilograms	Perilya Ltd., 100%	Broken Hill underground silver-zinc-lead mine at Broken Hill, NSW	81,200
Do.	do.	BHP Minerals Ltd., 100%	Cannington underground silver-lead-zinc mine, 200 km SE of Mount Isa, QLD	700,000
Do.	do.	Pasminco Century Mine Ltd., 100%	Century open pit zinc-silver-lead mine, 250 km NW of Mount Isa, QLD	3,000
Do.	do.	Pasminco Ltd., 100%	Cockle Creek silver smelter, NSW	85,000
Do.	do.	do.	Elura underground zinc-silver-lead mine, 40 km NW of Cobar, NSW	35,000
Do.	do.	Western Metals Ltd., 100%	Hellyer underground zinc-lead-copper-silver mine, 80 km SSW of Burnie, TAS	60,000
Do.	do.	AuironGold Ltd., 100%	Henty underground gold-silver mine, 30 km N of Queenstown, TAS	1,100
Do.	do.	Thalanga Copper Mines Pty. Ltd., 70%, and BML Holdings Pty. Ltd., 30%	Highway-Reward open pit and underground copper mine, 37 km S of Charters Towers, QLD	1,000

See footnotes at end of table.

TABLE 2--Continued
 AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2003

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities ^{1,2}	Annual capacity ^c
Silver--Continued: kilograms		MIM Holdings Ltd., 100%	Mount Isa underground copper-lead-zinc-silver mine (also includes enterprise, George Fisher, and Hilton mines) at Mount Isa, QLD	375,000
Do.	do.	Australian Gold Refineries, 100% (State of WA agency)	Newburn silver refinery, WA	81,000
Do.	do.	WMC Olympic Dam Operations Pty. Ltd., 100%	Olympic Dam underground copper-silver-gold-uranium mine at Roxby Downs. 80 km N of Woomera, SA	12,900
Do.	do.	Paddington Gold Pty. Ltd., 100%	Paddington open pit gold-silver mine, 35 km NW of Kalgoorlie, WA	500
Do.	do.	Peak Gold Mines Pty. Ltd., 100%	Peak underground gold-zinc-lead-copper-silver underground mine (includes New Cobar, New Occidental, and Perseverance), 8 km S of Cobar, NSW	6,000
Do.	do.	Pasminco Ltd., 100%	Port Pirie silver smelter, SA	450,000
Do.	do.	do.	Rosebery underground zinc-lead-silver-copper-gold mine, 35 km N of Queenstown, TAS	35,000
Spodumene	do.	Gwalia Consolidated Ltd., 100%	Greenbushes open pit/underground tantalite-spodumene mine, 70 km SE of Bunbury, WA	100
Steel		BHP Steel Pty. Ltd., 100%	Newcastle steelworks, NSW	1,800
Do.		do.	Port Kembla steelworks, NSW	4,000
Do.		do.	Sydney (Rooty Hill) minimill, NSW	250
Do.		do.	Whyalla steelworks, SA	1,200
Talc		Luzenac Australia Pty. Ltd., 100%	Three Springs open pit talc mine, 330 km N of Perth, WA	200
Tantalite, Ta ₂ O ₅	pounds	Gwalia Consolidated Ltd., 100%	Greenbushes open pit/underground tantalite-spodumene mine, 70 km SE of Bunbury, WA	600,000
Do.	do.	do.	Wodgina open pit tantalite mine, 100 km S of Port Hedland, WA	500,000
Tin, banch (in situ)		Telminex NL, 100%	Ardlethan alluvial tin mine, 90 km NW of Wagga Wagga, NSW	500,000
cubic meters		Sons of Gwalia Ltd., 100%	Greenbushes Smelter, WA	1
Do.		Renison Bell Ltd., 100%	Renison Bell underground tin mine, 136 km S of Burnie, TAS	13
Uranium, U ₃ O ₈	tons	Heathgate Resources Pty. Ltd., 100%	Beverley in situ leach uranium operation, 300 km NE of Port Augusta, SA	900
Do.	do.	WMC Olympic Dam Operations Pty. Ltd., 100%	Olympic Dam underground copper-silver-gold-uranium mine at Roxby Downs, 80 km N of Woomera, SA	1,500
Do.	do.	Energy Resources of Australia Ltd., 100%	Ranger open pit uranium mine, 230 km E of Darwin, NT	4,500
Vanadium, V ₂ O ₅	do.	Xstrata Windimurra Pty. Ltd., 100%	Windimurra open pit mine vanadium, 100 km ESE of Mount Magnet, WA	8
Zinc		Perilya Ltd., 100%	Broken Hill underground silver-zinc-lead mine at Broken Hill, NSW	360
Do.		BHP Minerals Ltd., 100%	Cannington underground silver-lead-zinc mine, 200 km SE of Mount Isa, QLD	100
Do.		Pasminco Century Mine Ltd., 100%	Century open pit zinc-silver-lead mine, 250 km NW of Mount Isa, QLD	500
Do.		Pasminco Ltd., 100%	Cockle Creek zinc smelter, NSW	90
Do.		do.	Elura underground zinc-silver-lead mine, 40 km NW of Cobar, NSW	125
Do.		Murchison Zinc Co. Pty. Ltd., 100%	Golden Grove underground zinc-copper mine (includes Gossan Hill and Scuddles), 225 km E of Geraldton, WA	150

See footnotes at end of table.

TABLE 2--Continued
 AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2003

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities ^{1,2}	Annual capacity ^e
Zinc--Continued:	Western Metals Ltd., 100%	Hellyer underground zinc-lead-copper-silver mine, 80 km SSW of Burnie, TAS	130
Do.	MIM Holdings Ltd., 100%	Mount Isa underground copper-lead-zinc-silver mine (also includes enterprise, George Fisher, and Hilton mines) at Mount Isa, QLD	175
Do.	Peak Gold Mines Pty. Ltd., 100%	Peak underground gold-zinc-lead-copper-silver underground mine (includes New Cobar, New Occidental, and Perseverance), 8 km S of Cobar, NSW	8
Do.	Pasminco Ltd., 100%	Port Pirie zinc smelter, SA	40
Do.	do.	Ridson zinc refinery, Hobart, TAS	230
Do.	do.	Rosebery underground zinc-lead-silver-copper-gold mine, 35 km N of Queenstown, TAS	100
Do.	Sun Metals Corp. Pty. Ltd., 100%	Sun Metals zinc refinery, Stuart, QLD	170

^eEstimated. NA Not available.

¹Australian State and Territory abbreviations: NSW New South Wales; NT Northern Territory; QLD Queensland; SA South Australia; TAS Tasmania; VIC Victoria; WA Western Australia.

²Bearing abbreviations: N north; NNE north-northeast; NE northeast; E east; SE southeast; SSE south-southeast; S south; SSW south-southwest; SW southwest; WSW west-southwest; W west; WNW west-northwest; NW Northwest; NNW north-northwest.

³Care and maintenance; expansion project development decision pending.

TABLE 3
AUSTRALIA: RESERVES OF MAJOR MINERAL COMMODITIES IN 2003

Commodity	Reserves
Bauxite	5,500
Black coal:	
In situ	55
Recoverable	39
Brown coal:	
In situ	42
Recoverable	38
Cadmium	844
Cobalt	1,450
Columbium (niobium)	29
Copper	40
Diamond:	
Gem and near gem	73
Industrial	75
Gold	5,380
Iron ore	12
Lead	19
Lithium	167
Magnesite (MgCO ₃)	344
Manganese ore	124
Mineral sands:	
Ilmenite	209
Rutile	21
Zircon	32
Nickel	23
Petroleum, recoverable:	
Condensate	282
Crude	227
Liquefied petroleum gas	262
Natural gas	2,220
Platinum-group metals (Pd, Pt)	23
Rare earths (REO plus Y ₂ O ₃)	1
Silver	43
Tantalum	41
Tin	146
Tungsten	9
Uranium, recoverable	675
Vanadium	0
Zinc	35

MgCO₃--magnesium carbonate; REO--rare-earth oxides; Pd--palladium;
Pt--platinum; Y₂O₃--yttrium oxide.

Source: Geoscience Australia, 2004, Australia's Identified Mineral Resources
2004: Canberra, Australia, Geoscience Australia, p. 9. (Modified to no more than
three significant digits.)